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NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

BARKER BRETTELL
138 Hagley Road
Edgbaston
Birmingham B16 9PW
ROYAUME-UNI

| | |
|--|---|
| Date of mailing (day/month/year) 26 October 2001 (26.10.01) | IMPORTANT NOTIFICATION |
| Applicant's or agent's file reference JL2627 | |
| International application No. PCT/GB00/03243 | International filing date (day/month/year) 23 August 2000 (23.08.00) |

1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

Name and Address

THE SECRETARY OF STATE FOR DEFENCE
Defence Evaluation and Research
Agency
Farnborough
Hants GU14 0LX
United Kingdom

State of Nationality

GB

State of Residence

GB

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person ☐ the name ☐ the address ☐ the nationality ☐ the residence

Name and Address

QINETIQ LIMITED
85 Buckingham Gate
London SW1 6TD
United Kingdom

State of Nationality

GB

State of Residence

GB

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office ☐ the designated Offices concerned
☐ the International Searching Authority ☒ the elected Offices concerned
☒ the International Preliminary Examining Authority ☐ other:

| | |
|---|---|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35 | Authorized officer S. Buttay Telephone No.: (41-22) 338.83.38 |
|---|---|

PCT

(PCT Rule 61.2)

**Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE**
in its capacity as elected Office

| | |
|--|--|
| Date of mailing (day/month/year) 19 June 2001 (19.06.01) | ETATS-UNIS D'AMERIQUE in its capacity as elected Office |
| International application No. PCT/GB00/03243 | Applicant's or agent's file reference JL2627 |
| International filing date (day/month/year) 23 August 2000 (23.08.00) | Priority date (day/month/year) 24 August 1999 (24.08.99) |
| Applicant GILLHAM, John. Peter et al | |

- ☒ in the demand filed with the International Preliminary Examining Authority on:

23 March 2001 (23.03.01)

- ☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was ☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

| | |
|---|---|
| <p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p> | <p>Authorized officer</p> <p>Olivia TEFY</p> <p>Telephone No.: (41-22) 338.83.38</p> |
|---|---|

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| | | |
|---|---|--|
| Applicant's or agent's file reference JL2627 | FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below. | |
| International application No. PCT/GB 00/03243 | International filing date (day/month/year) 23/08/2000 | (Earliest) Priority Date (day/month/year) 24/08/1999 |
| Applicant THE SECRETARY OF STATE FOR DEFENCE et al. | | |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

3h _____



None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

GB 00/03243

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G01J5/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01J H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|---------------------------|
| A | WOOD R A: "LOW-COST INFRARED IMAGERS" SCIENTIFIC HONEYWELLER, US, HONEYWELL'S CORPORATE. MINNEAPOLIS, 1996, pages 109-116, XP000678076 ISSN: 0196-8440 cited in the application page 111, column 2 -page 115, column 1 ---- | 1,2,6, 10-12, 17-20 |
| A | PATENT ABSTRACTS OF JAPAN vol. 1999, no. 05, 31 May 1999 (1999-05-31) & JP 11 044582 A (MATSUSHITA ELECTRIC WORKS LTD), 16 February 1999 (1999-02-16) abstract ---- | 3 |
| A | US 5 300 915 A (HIGASHI ROBERT E ET AL) 5 April 1994 (1994-04-05) column 1, line 38 -column 3, line 28 ----- | 7-9, 15, 16 |

☐

Further documents are listed in the continuation of box C.

☒

Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

12 December 2000

Date of mailing of the international search report

18/12/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

De Buyzer, H

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

GB 00/03243

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| JP 11044582 A | 16-02-1999 | NONE | |
| US 5300915 A | 05-04-1994 | US RE36136 E | 09-03-1999 |

(19) World Intellectual Property Organization
International Bureau



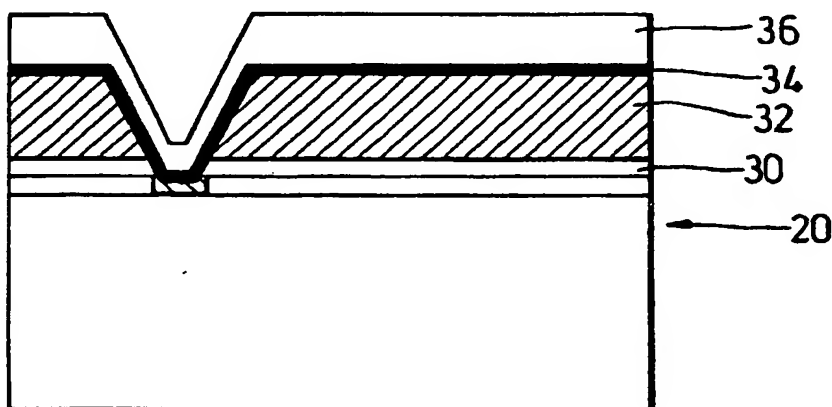
(43) International Publication Date
1 March 2001 (01.03.2001)

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(10) International Publication Number
WO 01/14838 A1

- (51) International Patent Classification⁷: **G01J 5/20**
- (21) International Application Number: **PCT/GB00/03243**
- (22) International Filing Date: **23 August 2000 (23.08.2000)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
9919877.2 **24 August 1999 (24.08.1999)** **GB**
- (71) Applicant (*for all designated States except US*): **THE SECRETARY OF STATE FOR DEFENCE [GB/GB]**; Defence Evaluation and Research Agency, Farnborough, Hants GU14 0LX (GB).
- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): **GILLHAM, John, Peter [GB/GB]**; Dera Malvern, St. Andrews Road, Malvern, Worcestershire WR14 3PS (GB). **WATTON, Rex [GB/GB]**; Dera Malvern, St. Andrews Road, Malvern, Worcestershire WR14 3PS (GB). **ALDERMAN, John, Charles [GB/GB]**; Dera Malvern, St. Andrews Road, Malvern, Worcestershire WR14 3PS (GB).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:**
- *With international search report.*
 - *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: **MICRO-BRIDGE STRUCTURE**



(57) Abstract: A method of fabricating a micro-bridge device (14, 16) onto a substrate (20). The method includes the steps of: providing a sacrificial material (32) on a surface region of the substrate (20); patternwise etching the sacrificial material (32); providing a sensing material (34) on a surface region of the sacrificial material; providing a support material (36) on a surface region of the sensing material; and removing the sacrificial material (32) leaving support material (36) with the sensing material (34) on its lower surface, substantially free standing above the substrate (20).

WO 01/14838 A1

PATENT COOPERATION TREATY

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14
FILED 08 NOV 2001

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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|--|--|--|
| Applicant's or agent's file reference JL2627 | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/GB00/03243 | International filing date (day/month/year) 23/08/2000 | Priority date (day/month/year) 24/08/1999 |
| International Patent Classification (IPC) or national classification and IPC G01J5/20 | | |



Applicant

THE SECRETARY OF STATE FOR DEFENCE et al. ¹ QINETIC LIMITED

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

| | |
|---|--|
| Date of submission of the demand 23/03/2001 | Date of completion of this report 06.11.2001 |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | Authorized officer Schmidt, C. Telephone No. +49 89 2399 2254  |

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB00/03243

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-26 as originally filed

Claims, No.:

19,20 as originally filed

1-18 as received on 12/10/2001 with letter of 12/10/2001

Drawings, sheets:

1/5-5/5 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03243

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|------|--------|--------|
| Novelty (N) | Yes: | Claims | 1 - 18 |
| | No: | Claims | |
| Inventive step (IS) | Yes: | Claims | 1 - 18 |
| | No: | Claims | |
| Industrial applicability (IA) | Yes: | Claims | 1 - 18 |
| | No: | Claims | |

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

SECTION V

1. The present invention, as defined in claim 1, relates to a bolometer wherein a support element is provided above a substrate. The support element supports on its underside a resistive sensing material respondent to incident radiation. The sensing material is supported above the substrate but connected at connecting regions to tracks on the substrate.
2. Such a bolometer is known from D1 = EP 0 566 156 A, which is considered as the closest prior art. In detail, D1 discloses in figure 10 (and column 23) a bolometer including a micro-bridge structure (310) suspended over a void (cavity 323a) above a substrate and comprising a support element (312) carrying on its underside a resistive sensing material (313a) which is exposed to the void and connected to tracks on the substrate (c. 23, l.29-31).
3. The bolometer of claim 1 differs from D1 in that the support element is arranged to absorb incident radiation. In D1 the support 312 does not absorb the incident radiation, but functions only as a bridge structure. Thus, claim 1 is novel.
4. Claim 1 is also considered inventive since there is no hint in the cited prior art to change the structure of D1 to include an absorbing support member.
5. Independent claim 8 is directed to a method of fabricating such a substrate. The method steps as defined are not known nor rendered obvious by the cited prior art.
6. The dependent claims include all the features of claim 1 or claim 8 respectively upon which they depend and are thus also considered novel and inventive.
7. Industrial applicability is given in the field of temperature measurement.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/03243

SECTION VI

Document GB-A- 233 5 077 was published on the 08.09.1999, ie after the priority date of the present application. This document may thus become relevant during national proceedings.

SECTION VII

The claims should have been drafted in accordance with Rule 6.3 b (two-part form) and 6.2 b (reference signs in claims) PCT, taking into consideration the document D1. This document should also have been acknowledged in the introductory part of the description pursuant to Rule 5.1 a) ii) PCT.

SECTION VIII

In claim 1 the wording "running from a region adjacent the substrate" is obscure and has not been taken into account when assessing novelty and inventive step.

CLAIMS

1. A bolometer comprising a micro-bridge structure having a substrate above which there is provided a support element, arranged to absorb
5 incident radiation, and on the underside of the support element there is provided a resistive sensing material arranged to change resistance in response to incident radiation, the sensing material being supported above the substrate by the support element but connected at connecting regions to tracks on the substrate and the support element running from a region
10 adjacent the substrate and comprising substantially a single layer of material.
2. A bolometer according claim 1 wherein the thickness of the support element is tailored to be substantially $\frac{1}{4}\lambda$ of the incident radiation within
15 the material of the support element.
3. A bolometer according to any one of the preceding claims wherein the support element is fabricated from SiO_2 .
- 20 4. A bolometer according to any one of the preceding claims wherein leg portions are provided to suspend the support element above the substrate and in which the sensing material is provided on the underside of the leg portions.
- 25 5. A bolometer according to any one of the preceding claims wherein the sensing material is provided as at least one track having a meandering structure.
6. A bolometer according to claim 5 wherein the meandering structure
30 has portions in transverse directions.

ART 34 AMDT

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7. A bolometer according to claim 6 wherein the transverse directions are substantially perpendicular to one another.
- 5 8. A bolometer according to any preceding claim wherein a matching layer is provided on an uppermost surface of the support element.
9. A method of fabricating a bolometer including a micro-bridge structure onto a substrate having the steps of:
- 10 a. providing a sacrificial material on a surface region of the substrate;
- b. patternwise etching the sacrificial material;
- c. providing a resistive sensing material on a surface region of the sacrificial material so that it contacts tracks on the substrate;
- 15 d. providing a support material on a surface region of the sensing material; and
- e. removing the sacrificial material leaving support material, with the resistive sensing material on its lower surface, substantially free standing above the substrate, such that the support material is
- 20 arranged to absorb incident radiation.
10. A method according to claim 9 in which the sacrificial material is polyimide.
- 25 11. A method according to claim 9 or 10 wherein the method comprises applying the support material such that it has a thickness of about $\frac{1}{4}\lambda$ where λ is the wavelength of the incident radiation of interest within the support material.
- 30 12. A method according to any one of claims 9 to 11 which comprises

providing the sensing material such that incident radiation having a specific polarisation cannot pass therethrough.

13. A method according to any one of claims 9 to 12 wherein the sensing material is provided as at least one meandering track.

14. A method according to claim 13 in which the at least one track is provided such that it has lengths running in directions transverse to one another.

15. A method according to any one of claims 9 to 14 wherein an encapsulated package is provided for the micro-bridge structure.

16. A method according to claim 15 comprising filling the encapsulated package with a gas having a low thermal conductivity, or evacuating the package.

17. A transducer incorporating a bolometer according to any one of claims 1 to 8.

18. A transducer according to claim 17 wherein the transducer is an IR transducer and/or emitter.